Table 2.6-1. Badger Hills Plan of Development--Comparison of Alternatives

Project Component	Alternative A–No BLM Approval (No Action, State and private land development only)	Alternative B—Fidelity Proposed POD (State & private actions plus BLM approval)	Alternative C—Proposed POD with added Mitigation Measures
Well Drilling Activities:			
Number and land status of CBNG wells	0 Federal wells 20 State wells 72 Private wells	86 Federal wells 20 State wells 72 Private wells	86 Federal wells 20 State wells 72 Private wells
Wells per drill site	20 State wells drilled from 4 sites with 5 wells per site. 72 Private wells drilled from 18 sites with up to 5 wells per site. Well pad not required for most sites.	85 Federal wells drilled from 18 sites with up to 5 wells per site. 1 previous well placed on production. Same as Alternative A for 20 State and 72 Private wells. Well pad not required for most sites	Same as Alternative B with the following measures: • Dust control measures with 50% control efficiency would be required during construction activity.
Drill hole construction	92 wells drilled by truck mounted drilling rigs to depths from 100 to 1,000 feet. Air and fresh water (including coal seam water) would be used in drilling, supplemented as needed by bentonite and sawdust or wood chips. Steel casing would be cemented in place from ground surface to the top of the target coal seam. The casing would be sized to accommodate a downhole pump to lift water, but would typically be seven inches in diameter. The well would then be drilled to the base of the target coal and under reamed to increase the exposed coal surface for production.	178 wells would be drilled in the same manner as described under Alternative A.	• 178 wells would be drilled in the same manner as described in Alternative A with the following measures. • A diverter would be installed to control uphole pressures and a minimum of three centralizers would be installed on the production casing spaced to protect shallow coals and aquifers. • Specific measures would be required to keep wildlife and livestock out of reserve pits.

Project Component	Alternative A–No BLM Approval (No Action, State and private land development only)	Alternative B—Fidelity Proposed POD (State & private actions plus BLM approval)	Alternative C—Proposed POD with added Mitigation Measures
Disposal of drilling wastes	Drill cuttings, water and drilling muds would be placed in two pits approximately 6'W by 15'L by 15'D and fenced with a wire fence to keep out livestock and wildlife. After conclusion of drilling operations, fluids in the pits would be removed and either used for other drilling operations or disposed in an approved manner and the pits backfilled after the mud is dried. Wastes accumulated during drilling and completion operations would be contained on the well site and disposed at the Sheridan sanitary landfill. Chemical "porta-potties" used at active construction, drilling and battery sites.	Same as Alternative A.	Same as Alternative A with the following measures: • Reserve pits would be lined if permeable subsurface material is encountered during construction of the pit. • Only drilling mud, cuttings, rigwash and excess cement and certain completion and stimulation fluids would be permitted in reserve pits during drilling or closure.
Access:			
Road construction and maintenance	Access would use existing bladed roads, plus 14 miles of two track trails or across undisturbed rangeland following pipeline corridors with temporary roads. Culverts installed at drainage crossings where needed. Gravel or scoria needed for surfacing would come from operators private pit permitted by the MDEQ. Approximately 3.4 miles of existing roads would be upgraded to all weather conditions.	Access would use existing bladed roads, plus 22 miles of two track trails or across undisturbed rangeland following pipeline corridors with temporary roads. Culverts installed at drainage crossings where needed Gravel or scoria needed for surfacing would come from operators private pit permitted by the MDEQ. Approximately 4.4 miles of existing roads would be upgraded to all weather conditions.	Same as Alternative B with the following measures: • No construction of the BLM Right of Way during periods when soils are too wet to support construction equipment. • Dust control measures with 50% control efficiency would be required during construction activity.

Project Component	Alternative A–No BLM Approval (No Action, State and private land development only)	Alternative B—Fidelity Proposed POD (State & private actions plus BLM approval)	Alternative C—Proposed POD with added Mitigation Measures
Access road use	Operator to post speed limits on access roads adjacent to mountain plover habitat and sage grouse leks and brood-rearing areas.	Estimated use of access is 4 vehicles per day during drilling, 2 vehicles per day during testing and 1 vehicle per week during production (early) and 1 vehicle per month (after first 4 months). Operator to post speed limits on access roads adjacent to mountain plover habitat and sage grouse leks and brood-rearing areas.	• Speed limit established and enforced by operator would be required to achieve at least a 65% reduction in dust emissions from a base speed of 40 mph. • Dust control measures would be required on active access roads that are unpaved.
Production Support Facilities:			
Support Facility Corridors	Construct 9 miles of combined gas/water and two track roads.	Construct 17 miles of combined gas/water and two track roads and one mile of 8 to 12 inch steel gas line.	• Construct 17 miles of combined gas/water and two track roads and one mile of 8 to 12 inch steel gas line.
Gas Flowlines	Buried plastic flowline to carry gas from each well of the 92 wells to the battery site. Multiple flowlines placed in same trench. Trenches would parallel roads to extent feasible.	Buried plastic flowline to carry gas from each well of the 178 wells to the battery site. Multiple flowlines placed in same trench. Trenches would parallel roads to extent feasible.	• Buried plastic flowline to carry gas from each well of the 178 wells to the battery site. Multiple flowlines placed in same trench. Trenches would parallel roads to extent feasible. • Pipelines would not change or block natural drainage courses, would not run parallel to drainage bottoms and would only cross perpendicular to drainages.

Project Component	Alternative A–No BLM Approval (No Action, State and private land development only)	Alternative B—Fidelity Proposed POD (State & private actions plus BLM approval)	Alternative C—Proposed POD with added Mitigation Measures
Field Battery (compressor) sites	One existing field battery (Conner 33 Battery) would be used to process gas from private wells. Three new field battery sites would each be constructed on approximately 2 acres and enclosed with barbed wire fence. One or two meter houses and up to two compressors would be located at the Montana State 36 Battery (state surface and minerals at battery site) and up to three compressors at the Seven Brothers 35 and Consol 27 Batteries (private surface and minerals at battery site). Waukesha F18 GL 400 hp compressor units are planned for all field batteries (up to 6 meter houses and 8 compressors new compressors). Meter houses and compressor buildings would be painted to blend with the surrounding landscape.	One existing field battery (Conner 33 Battery) would be used to process gas from private wells. Four new field battery sites would each be constructed on approximately 2 acres and enclosed with barbed wire fence. One or two meter houses and up to two compressors would be located at the Montana State 36 Battery (state surface and minerals at battery site) and Visborg 25 Battery and up to three compressors at the Seven Brothers 35 and Consol 27 Batteries (private surface and minerals at battery site). Waukesha F18 GL 400 hp compressor units are planned for all field batteries (up to 6 meter houses and 10 new compressors). Meter houses and compressor buildings would be painted to blend with the surrounding landscape.	Same as Alternative B with the following measures: • Dust control measures with 50% control efficiency would be required during construction activity. • Dust control measures would be required on active battery sites.
Sales Battery (compressor) sites	One, Symons Central Compressor Station (private surface and minerals at battery site).	Same as Alternative A.	Same as Alternative A (MDEQ air quality permit requires dust control provisions).

Project Component	Alternative A–No BLM Approval (No Action, State and private land development only)	Alternative B—Fidelity Proposed POD (State & private actions plus BLM approval)	Alternative C—Proposed POD with added Mitigation Measures
Powerlines	Electricity would be brought into the project area from existing lines to the north and south. 5.5 miles of aerial powerlines would be installed parallel to an access road or follow the most direct route to a subsection of the project area. 8 miles of buried electrical cables would tie into the aerial power lines at a service tap which typically would serve up to three wells. Electricity would be provided to each battery site by a buried cable or an aerial line.	Electricity would be brought into the project area from existing lines to the north and south. 8 miles of aerial powerlines would be installed parallel to an access road or follow the most direct route to a subsection of the project area Plus, aerial power lines would be constructed to comply with the avian standards mitigation measures prescribed in the MT EIS. 13.5 miles of buried electrical cables would tie into the aerial power lines at a service tap which typically would serve up to three wells.	Same as Alternative B.
Produced Water Management:			
Flowlines	Produced water would be transported through buried plastic flowlines from each well site to: a) 4 discharge points along the Tongue River, b) 2 off-channel, total containment stock water reservoirs, c) 2 off-channel, total containment storage reservoirs for irrigation, or d) coal mines. 9 miles of these flowlines would be constructed within corridors also used for natural gas pipelines and along two track roads. An additional 3.5 miles of water pipeline are outside corridors.	Produced water would be transported through buried plastic flowlines from each well site to: a) 4 discharge points along the Tongue River, b) 2 off-channel, total containment stock water reservoirs, c) 2 off-channel, total containment storage reservoirs for irrigation, or d) coal mines. 17 miles of these flowlines would be constructed within corridors also used for natural gas pipelines and along two track roads. An additional 3.5 miles of water pipeline are outside corridors.	Same as Alternative B with the following measures: • Pipelines would not change or block natural drainage courses, would not run parallel to drainage bottoms and would only cross perpendicular to drainages.

Project Component	Alternative A–No BLM Approval (No Action, State and private land development only)	Alternative B—Fidelity Proposed POD (State & private actions plus BLM approval)	Alternative C—Proposed POD with added Mitigation Measures
Impoundments	Three new reservoirs would be built in natural depressions to hold produced water. One existing reservoir would also be utilized. The reservoir dams would be constructed of clay soil compacted in lifts. Low permeability clay placed in the bottom and sides of each reservoir. An emergency spillway constructed to pass the 100-year, 24-hour storm event would be constructed adjacent to each dam.	Same as Alternative A.	Same as Alternative A with the following mitigation measures: • 2 monitoring wells will be installed adjacent to each impoundment. • The effluent limitations and monitoring requirements contained section I. B in the DRAFT MDEQ General Discharge Permit will apply.
Irrigation/Land Application	Some of the produced water would be used to irrigate native vegetation in the valley bottom near Badger Creek and on a plateau above Badger Creek. Irrigation would be conducted under a contract with the surface owner and accomplished by either center pivot or solid set irrigation systems. Agricultural amendments would be added to either the soil or produced water as a result of analysis.	Same as Alternative A.	Same as Alternative A with the following mitigation measures: • Monitoring wells would be installed adjacent to the irrigation areas to assess impacts to groundwater or the potential for formation of seeps. • Managed irrigation sites would be monitored and impacts addressed after produced water irrigation ceases until surface owner approved productivity levels have been established.

Project Component	Alternative A–No BLM Approval (No Action, State and private land development only)	Alternative B—Fidelity Proposed POD (State & private actions plus BLM approval)	Alternative C—Proposed POD with added Mitigation Measures
MPDES Discharge of Produced Water	Total Discharge to the Tongue River from the CX Field and Badger Hills Project will be 1,600 gpm for 3 months. The Badger Hills Project will use four outfall points along the Tongue River. Discharge points will be located near main channel in areas with low gradients. Each outfall structure will consist of a riprap pad surrounding the pipe with a narrow riprap lined trench sloping into the channel area.	Same as Alternative A, except that the duration of the 1,600 gpm discharge to the Tongue will be 17 months.	Same as Alternative B
Reclamation:			
Measures	Disturbed areas would be recontoured, stored topsoil applied over the area, erosion controls installed and the disturbed area seeded with a certified seed mix agreed to with the surface owner.	Same as Alternative A.	Same as Alternative A with the following measures. Reclamation would require: • Updated plans at the time of closure • Reserve pit closure standards • Seedbed preparation standards • Soil testing or treatment • Establishment of vegetation success standards • Erosion control measures • Seed mixtures for the BLM Right of Way Bond release standards, including involvement of private surface owners

Project Component	Alternative A–No BLM Approval (No Action, State and private land development only)	Alternative B—Fidelity Proposed POD (State & private actions plus BLM approval)	Alternative C—Proposed POD with added Mitigation Measures
Timeframes	Reclamation would take place within 1 year where specific surface disturbing activities have been completed and concurrent with other operations in the project area. Final reclamation would be completed approximately 2 to 3 years following the end of gas production.	Same as Alternative A.	Same as Alternative A with the following measures: • Fall seeding would occur after September 15 and prior to prolonged ground frost. Spring seeding would occur after the frost has left the ground and before May 15. • BLM evaluation of reclamation success would be made after the second complete growing season.
Monitoring Plans:			
Air Quality	Per MDEQ Requirements for testing to demonstrate compliance with emission limits and Annual Emission Inventories.	Same as Alternative A.	Same as Alternative A.
Wildlife	None required	Monitoring of specific wildlife species is required in WMPP including: Big game crucial winter range Prairie dog towns and suitable mountain plover habitat Raptor nest productivity (including bald eagle) Bald eagle winter roosts Sage and sharptail grouse lek attendance	Same as Alternative B with the following measure: • Fidelity employees and subcontractors would be prohibited from possessing firearms on the project.
Soils/LAD	See Appendix 2 for summary including: Applied water quality and quantity Applied soils response to irrigation Vegetation response Off site impacts	Same as Alternative A.	Same as Alternative A.

Project Component	Alternative A–No BLM Approval (No Action, State and private land development only)	Alternative B—Fidelity Proposed POD (State & private actions plus BLM approval)	Alternative C—Proposed POD with added Mitigation Measures
Water Quality/Seepage	Per MDEQ MPDES Requirements	Same as Alternative A.	Same as Alternative A with the following requirements: • Monitoring wells will also be required adjacent to impoundments and irrigation areas. The Effluent limitations and monitoring requirements of section I.B of the MDEQ DRAFT General Discharge Permit will apply. • Would require POD reference wells and sampling according to MDEQ MPDES criteria.